Power Wave Manager™
User Manual

Y50050-02

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1 Description

Power Wave Manager™ is an application that allows you to configure and manage a multitude of settings and configuration options within the full range of Lincoln Electric's Power Wave® line of welding machines. It also provides in-depth diagnostics of the machine's hardware and firmware to help identify and eliminate any issues with welding or configuration.

2 System Requirements

Minimum hardware requirements:

- 256MB system RAM.
- 1.0GHz processor speed.
- 1024×768 display resolution.
- 50 MB free disk space.
- Connection to a Lincoln Electric Power Wave or compatible machine through an Ethernet network or serial (RS-232) cable.

Power Wave Manager runs under the Microsoft .NET Framework. Therefore, it may be run within any of the following versions of Microsoft Windows:

- Windows 7
- Windows Vista
- Windows XP Service Pack 2
- Windows 2000 Service Pack 4
- Windows 98 Second Edition

Must be logged on as an Administrator to the PC.

3 Compatible Equipment

Power Wave Manager may be used with any welding machine in Lincoln Electric's Power Wave® family that utilizes the digital controls platform. This list includes, but is not limited to:

- Power Wave 355M
- Power Wave 405M
- Power Wave 455M, 455M/STT, 455R (and corresponding CE models)
- Power Wave 655
- Power Wave AC/DC 1000, AC/DC 1000 SD
- Power Wave i400
- Power Wave C300
- Power Wave S350

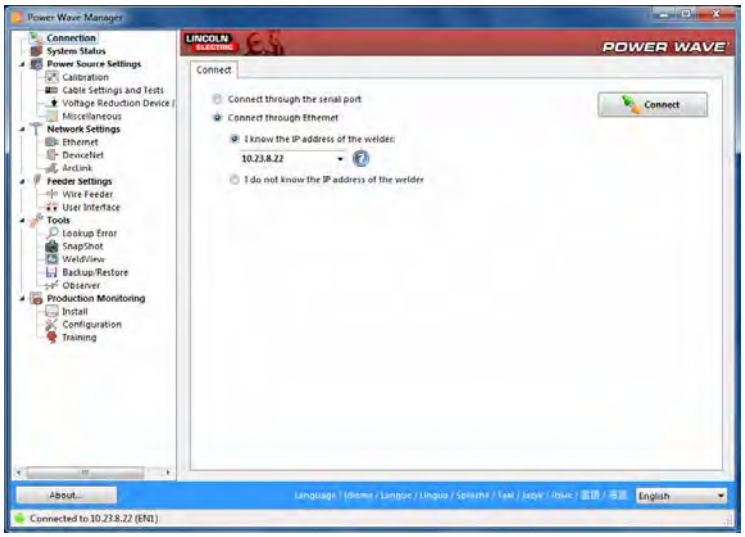
The program may also be used to diagnose and modify settings in the following machines outside the Power Wave family that also use the digital common controls platform:

- Invertec V350, V450
- Power MIG 300
- Power MIG 350

The program is not compatible with legacy Power Wave models such as the Power Wave 450.

4 Establishing a Connection

When Power Wave Manager is started, it displays a list of categorized configuration sections on the left.

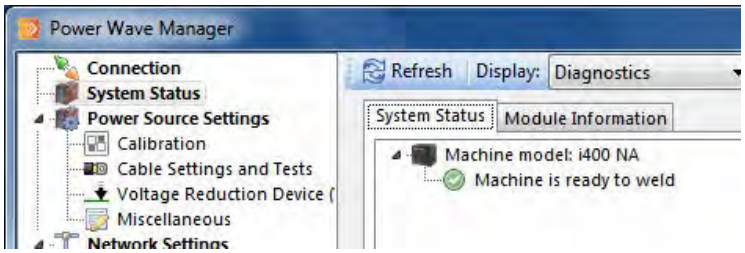


These sections are *Connection*, *System Status, Power Source Settings, Network Settings, Feeder Settings*, and *Tools*. By default, Power Wave Manager starts up in the Connection section, since a connection is required for accessing most of the other sections, except Lookup Error and WeldView.

For assistance with connecting to your welding machine, please refer to the *Help Me Connect Guide* included with the Power Wave Utilities installation. The guide is also downloadable from http://powerwavesoftware.com.

5 System Status

When the program first establishes a connection to the machine, it switches to the System Status section. In this tab the program displays any problems that might be present in the machine, no matter how benign the issue might be.

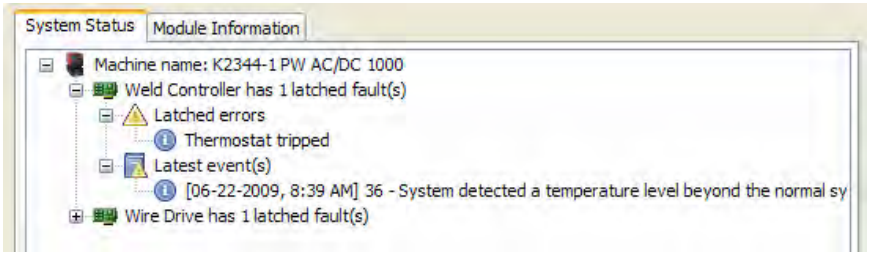


If there are no problems in the machine, the program will show a green check mark, and display a "Machine is ready to weld" message, as shown in the illustration.

At the top of this section is a drop-down box that provides the selections "Diagnostics" and "Detailed Status." The default selection is Diagnostics.

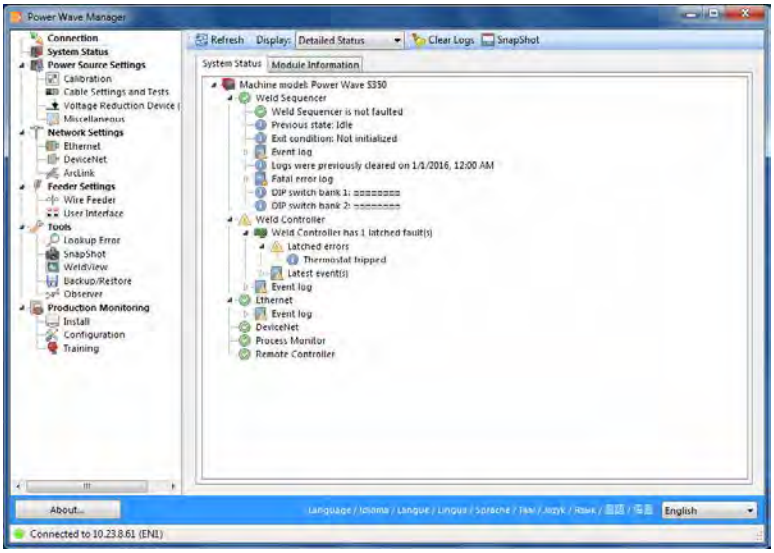
5.1 Diagnostics

If the program detects a malfunction in the system, it will attempt to determine which hardware module caused the malfunction.


System Status
Module Information
Machine name: K2344-1 PW AC/DC 1000
Weld Controller has 1 latched fault(s)
Latched errors
Thermostat tripped
Latest event(s)
[06-22-2009, 8:39 AM] 36 - System detected a temperature level beyond the normal sy
Wire Drive has 1 latched fault(s)

Note: To retrieve more information about a certain error code, refer to the "Lookup Error" section, discussed in section 10.1. You may also double-click on the error to automatically go to the Lookup Error section.

5.2 Detailed Status



The "Detailed Status" selection shows the status of each logical object in the machine. In the illustration on the right, all objects are functioning normally, except one (the Weld Controller).

When the faulted object is expanded, the program shows the number and description of the fault that the object is currently experiencing.

In addition to the actual faulted condition, an object may also have events recorded in its historical Event Log. These events can provide additional information about the cause of any problem. An event may be residual from a previous malfunction, or it could be associated with the current malfunction. An event does not always indicate a malfunction, but can be posted as a status item. Even objects that are ready to weld might still have events recorded in their log. Each event has a time stamp and a textual description of the event. For modules that have a real-time clock, such as a Robot or Ethernet object, the time stamp will indicate the time of the event. Otherwise, the time stamp indicates the amount of time elapsed since the machine was powered up.

It is generally recommended to periodically clear the event logs of any object that might have events, so that it will be certain that any logged events will be recent, and will apply to the most recent problem. If the machine experiences an error severe enough that the machine is forced to reset, the error is recorded in a Fatal Error Log entry as shown above.

5.3 Module Information

The Module Information tab displays information about each hardware module inside the Power Wave. This information includes versions of the hardware and firmware of each module, serial numbers, Weld Set name, and miscellaneous information such as firmware revision numbers and checksums.

Switch between different tabs at the top to view information about the corresponding hardware module.

5.4 Additional Options

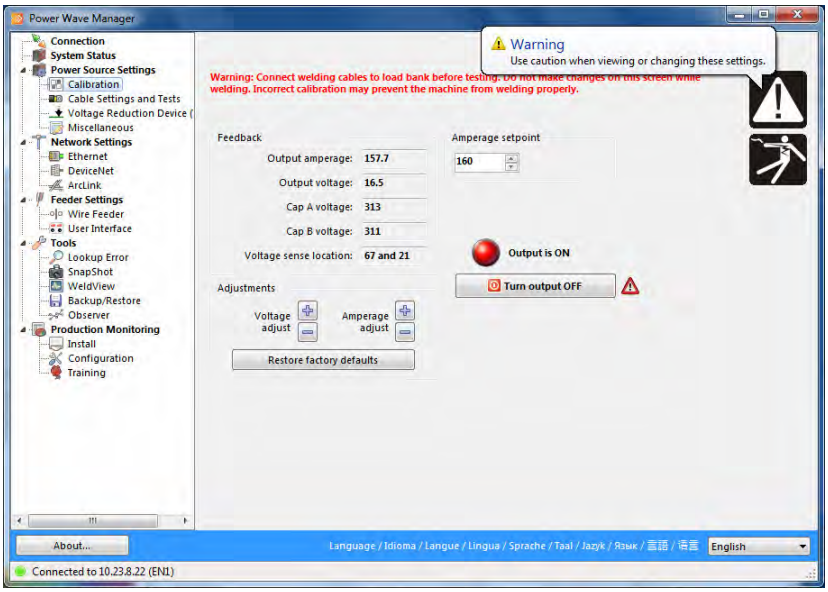
- **Refresh button**: Click this button to re-scan the machine for problems and refresh the results in the status window.
- **Clear Logs button**: Click this button to clear the logs in all modules in the system. This includes Event Logs and Fatal Error Logs. After the logs are cleared in this manner, the machine will remember the last time its logs were cleared, and this data will be available the next time system status information is shown. Note that this action will reset the machine, so it should not be done while the machine is in use.
- **SnapShot button**: Click this button to go directly to the SnapShot section (10.2), so that a snapshot of the system can be easily acquired.

6 Power Source Settings

The Power Source Settings section consists of various subsections that contain settings for to the power source component of the welding system.

6.1 Calibration

The Calibration section allows calibrating the machine by adjusting the amperage and voltage outputs so that they match a setpoint value. This function can also be used to activate the machine output for other troubleshooting purposes.



The "Turn Output On" button enables the output of the machine. When output turns on, the "Output is ON" indicator will begin to flash red, and values will appear for Output Amperage, Output Voltage, Capacitor Voltages, and Voltage Sense Location. While output is on, make the necessary adjustments by clicking the up/down buttons that appear on the bottom left of the window. The amperage setpoint can be changed by clicking the up/down arrows next to the text box, or by entering the desired amperage directly into the text box.

Note: When adjusting Amperage from Power Wave Manager, any external ammeter will adjust to the "set" amperage value. When adjusting Voltage, the displayed diagnostic voltage will adjust to the external voltmeter which would be holding steady. Do not calibrate voltage at voltages greater than 50V.

When finished making adjustments, click the "Turn Output Off" button to disable the machine's output. Output will be disabled automatically if you leave the Calibration section, or if you exit the application entirely.

6.1.1 Recommended Procedure

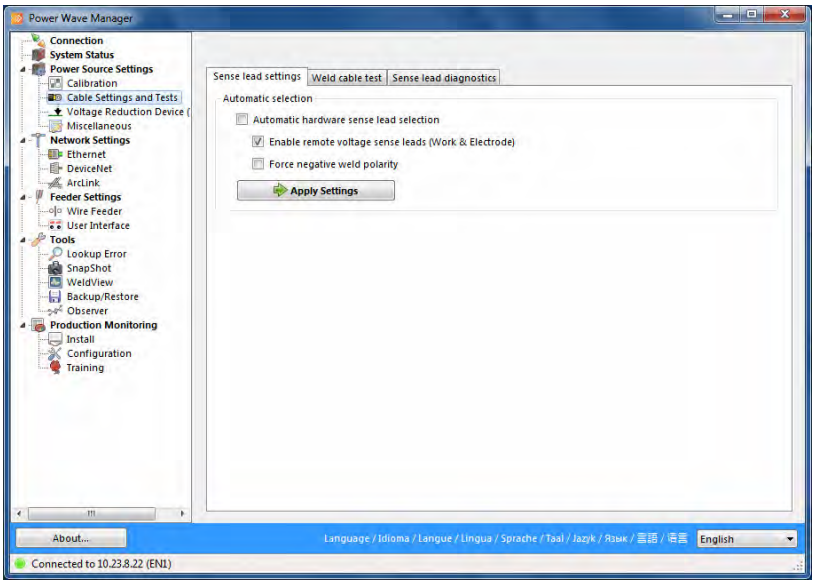
1. Attach machine output cables to a 300A/30V resistive grid load.
2. Turn output "ON."
3. Use adjustments to trim the feedback values to match actual measured values.

6.1.2 Quick Procedure (Amperage adjustment only)

1. Short the output studs with a cable at least 10ft long (in place of a Grid Load).
2. Turn output "ON."
3. Use adjustments to trim the feedback values to match actual measured values.

6.2 Cable Settings

These settings allow you to configure and test your welding cables and sense leads.



6.2.1 Sense Lead Settings

Note: These settings will only be shown for machines that do not have DIP switches for modifying the sense lead location. They will also be hidden for machines that do not support changing the sense lead selection.

Use these settings to enable or disable automatic hardware sense lead selection, and to modify its behavior. For most applications, the "Automatic hardware sense lead selection" is the best method to use; it reduces the chance of fairing and losing tips due to sense lead lose.

The system can be configured to force sense arc voltage from the work sense lead (21 lead) instead of the negative output stud. This requires connecting to the voltage sense connector and attaching the work lead to the work. To enable the work sense lead, uncheck the "Automatic hardware sense lead selection" checkbox, and check the "**Enable remote voltage sense leads**" checkbox, then click the "Apply Settings" button. The system will reset, and the arc voltage will then be detected at the electrode (67 lead) and the work (21 lead).

If negative welding polarity is required, then you may need to manually configure the correct voltage sense location. If the system is already configured to sense arc voltage at the remote voltage sense leads, then no changes are required. Otherwise, uncheck the "Automatic hardware sense lead selection" checkbox, and check the "**Force negative weld polarity**" checkbox, then click the "Apply Settings" button. The system will reset, and the arc voltage will then be detected at the electrode (67 lead) and the positive stud.

Note: If the sense lead selection is specified within the welding procedure in use, it will have precedence over these settings. Therefore, some welding processes, such as TIG, Stick, and SMAW, will override these settings.

6.2.2 Weld Cable Test

The weld cable test allows you to automatically measure the resistance and the inductance of your welding circuit. This can be used to determine how setup changes affect the welding circuit. In order to run this test, the contact tip must be shorted to the work piece.

Click the "Perform Test" button to begin the inductance and resistance test. Note that when this test is preformed, the machine's output will be turned on for a very short time (100 milliseconds). Once the test is complete, it will display the resistance and inductance values that were calculated based on the downloaded weld trace. The resistance value is displayed in the upper text box (measured in milliohms), and the inductance value is displayed in the lower text box (measured in microhenries).

Note: It is good practice to record the results of these tests when the welding system is operating well, so that they can be compared to values taken when there are welding problems on the same weld cell. This may help isolate the problem when the old and new numbers are significantly different.

6.2.3 Sense Lead Diagnostics

Use these settings to troubleshoot welding issues or verify setup by manually changing the location of the sense lead. Any changes made in this tab are temporary, and will be reset when the machine's power is turned off.

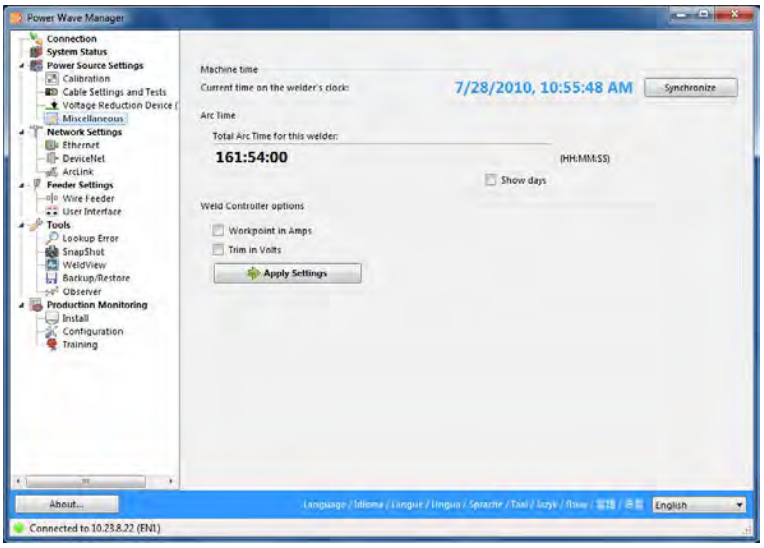
Arc voltage sense leads can become detached over time due to constant movement of equipment such as robot motion. The settings on this tab allow you to test and verify the connectivity and reliability of the current voltage sense selection. This is done by a process of testing voltage sense starting at the studs, then incrementally moving to the remote voltage sense locations. Note that this test can not be done with Servo Torch.

Automatic Test
The "**Test sense lead selection**" button can additionally help troubleshoot sense lead issues by attempting to detect the sense lead location by turning on the machine's output in an OCV (open circuit voltage) mode, and automatically reading back voltage while stepping through the various manual sense lead locations, determining which location is most likely the one being used. Make sure your welding circuit is open before performing this test.

Manual Test
To start testing the voltage sense leads, click on the "**Select sense lead location manually**" selection. This will force the machine to sense voltage from the selected location. Click the "Apply" button when changing the sensing selection. The first location to test is "**Output Studs**." This configuration utilizes arc voltage sensing from inside the machine and does not require polarity to be configured. Once the output studs arc voltage sensing location has been verified, you may select the next sensing location such as "**67 Positive**" or "**67 Negative**," depending on the welding polarity in which the system is configured to operate. Once the 67 sensing location has been verified, you may select to sense at "**67 and 21**" if you are utilizing both remote voltage sense leads.

When the testing is complete, reset the power to the machine to clear any changes made to the voltage sense location.

6.3 Miscellaneous



The Machine time section displays the current time on the machine's internal clock. This time is used when recording internal events, errors, and Production Monitoring information. The Production Monitoring application, if present, periodically sets the machine's clock to match the time of the Production Monitoring server. You can also manually sync the clock by clicking the "Synchronize" button.

The Arc time section also displays the total arc time of the Power Wave (total amount of time that the machine has generated an arc). The time will be shown in HH:MM:SS format (hours, minutes, and seconds). If the number of hours is greater than 23, click the "Show days" check box to convert the hours into days and display the result.

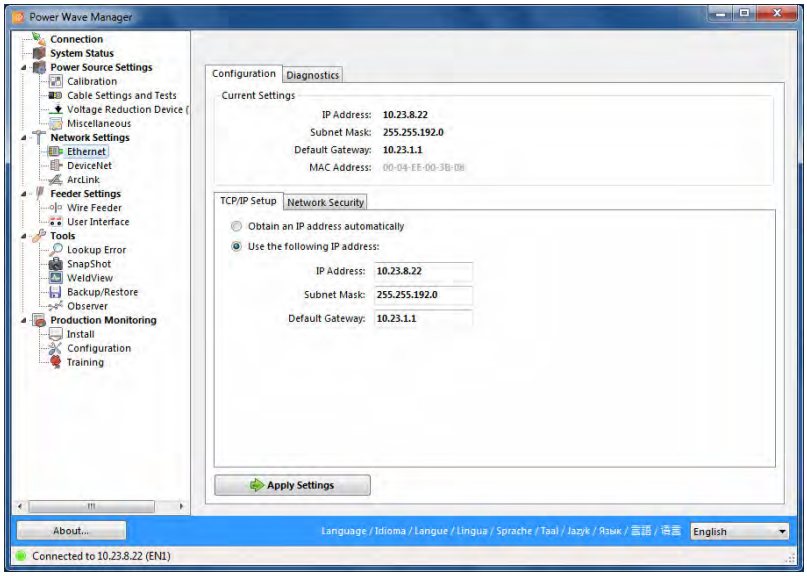
The Weld Controller options section can be used to set various control options for welders that support these options. The Workpoint in Amps item is used to set the output level based on Amps instead of WFS. The Trim in Volts item is used to set the output level based on voltage instead of an unitless control.

7 Network Settings

This section consists of three subsections, all of which configure the various ways that a Power Wave can be networked with other equipment.

7.1 Ethernet

This section provides options for configuring the Power Wave's network settings for use on an Ethernet network.



7.1.1 Configuration Section

At the top of the section Power Wave Manager displays the machine's current network settings, including IP Address, Subnet Mask, and Default Gateway:

- **IP Address**: This is the address at which the Power Wave is located on the network. Any network device attempting to communicate with the Power Wave must use this address.
- **Subnet Mask**: This number, assigned by the network administrator.
- **Default Gateway**: This is the IP Address of a router or other device that allows communication with addresses that are outside the local area network.

8 TCP/IP Setup

In the TCP/IP setup tab, click the "Obtain an IP address automatically" check box to allow the machine to automatically obtain network settings, or click the "Use the following IP address" check box to manually enter network settings.

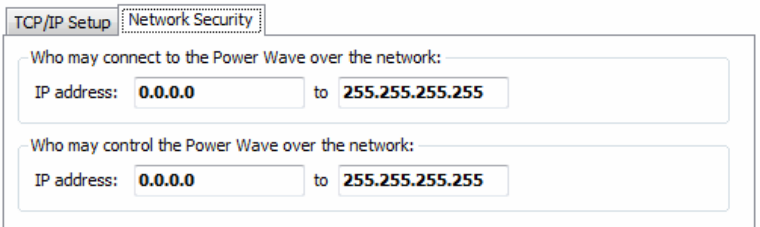
***Caution**: Assigning an incorrect IP address to the Power Wave may cause it to become unreachable on the network. If you are unsure about what IP address to assign to the machine, consult your IT department or network administrator.*

Once all network settings have been configured, click the Apply Settings button to confirm the settings and reset the machine (this is necessary for the new settings to take effect). If you have modified the machine's IP address, and would like to modify more settings, you will need to connect to the machine using the new address.

Note: If the machine will be used for ArcLink XT (e.g. for use with a robotic controller), you must select "Obtain an IP address automatically."

8.1.1.1 Network Security

The Network Security tab allows the configuration of a range of IP addresses that are allowed to connect to the machine, as well as another range of addresses that are allowed to *modify* parameters on the machine (the latter range is a subset of the first).


TCP/IP Setup
Network Security
Who may connect to the Power Wave over the network:
IP address: 0.0.0.0 to 255.255.255.255
Who may control the Power Wave over the network:
IP address: 0.0.0.0 to 255.255.255.255

For each of the two ranges, the user can select either all addresses, addresses only within the machine's subnet, or a custom range of addresses.

For example, if the custom range is from 192.168.1.0 to 192.168.1.255, then a computer whose IP address is 192.168.1.10 will be able to access this machine, but a computer whose IP address is 192.168.2.1 will not.

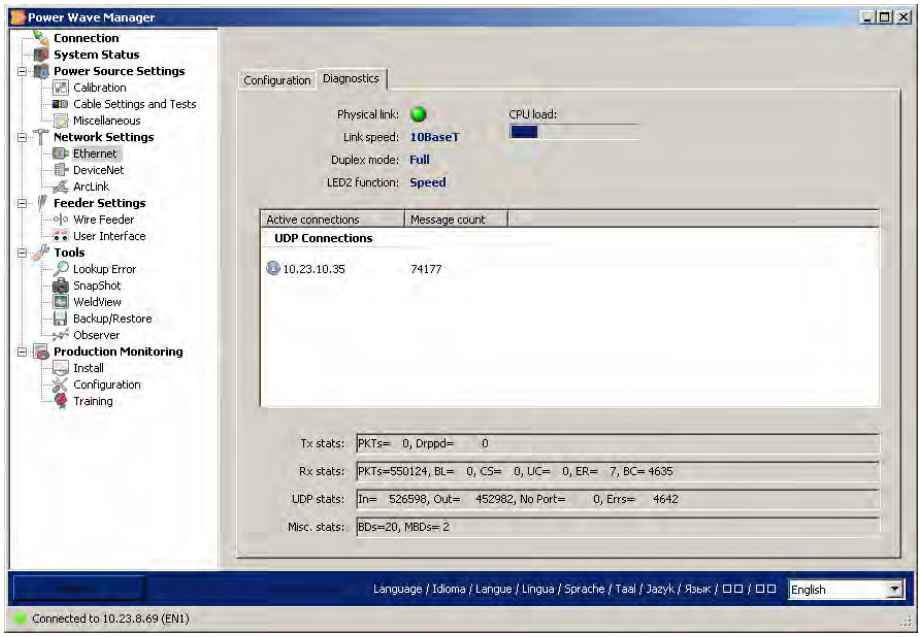
8.1.1.2 Multiple Ethernet Modules

If the system to which Power Wave Manager is connected contains more than one Ethernet module (e.g. a Power Wave AC/DC 1000 connected to a System Interface module), the different modules will show up as a pull-down list at the top of the Ethernet section. Switch between the pull-down selections to configure settings for each module.

To identify which of the multiple modules is currently selected, click the "Blink status light" button. This will cause the status light of the selected module to start blinking rapidly, so that it can be visually identified.

8.1.2 Diagnostics Section

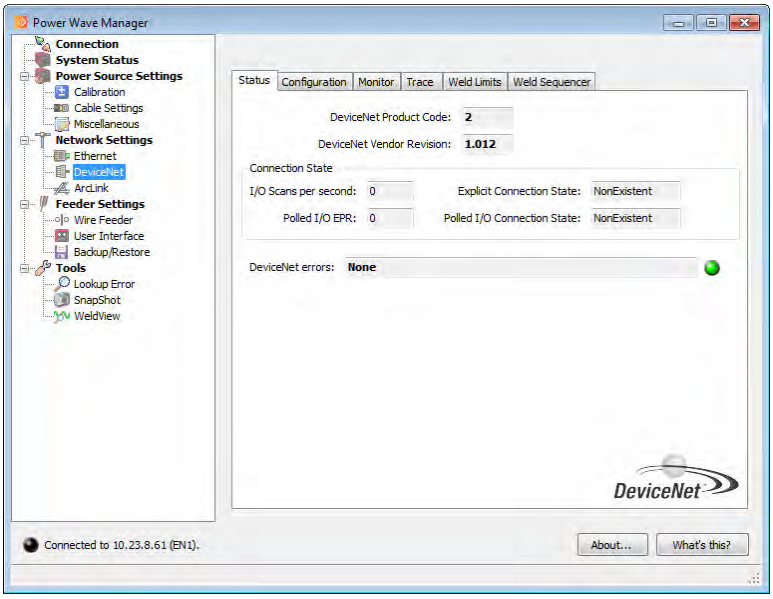
The diagnostic tab under the Ethernet Network Setting item shows how the Ethernet communications are configured in the machine and gives some basic diagnostic information, see below.



8.2 DeviceNet

The DeviceNet section allows the setup and verification of a DeviceNet interface to the Power Wave.

This section consists of several tabs that are discussed below.

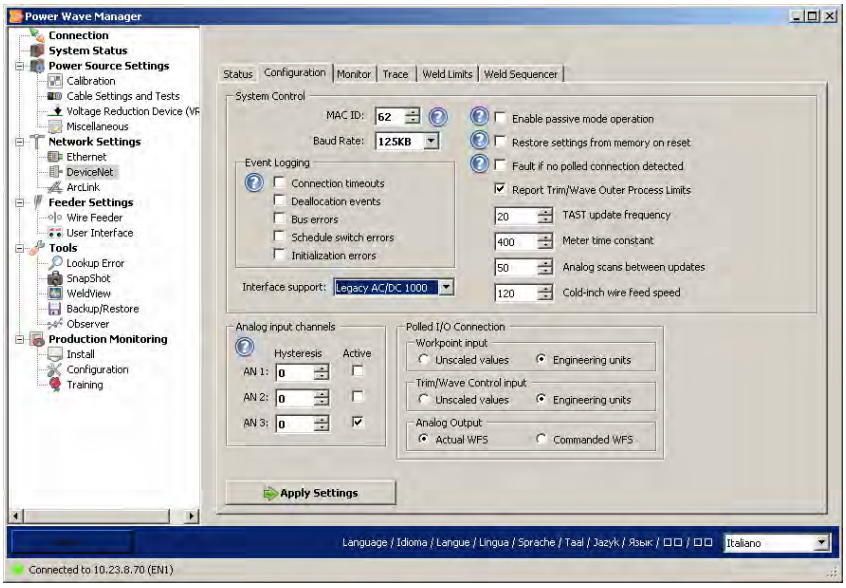


8.2.1 Status

This tab contains basic status information about the Power Wave's DeviceNet interface, as well as any errors currently present on the interface.

8.2.2 Configuration

This tab contains detailed configuration options for the DeviceNet interface. For general information on setting up the DeviceNet interface, refer to the DeviceNet Interface Specification document (Y50031) included with the Power Wave Utilities installation.



8.2.2.1 Mac ID

This field indicates the current configuration of the Power Wave's DeviceNet MAC ID. For the PW455, PW455M, ACDC1000, and PW655 and welders that use the K2436-1 Ethernet/DeviceNet Communication Interface, this value will only change if the DIP switches on the Power Wave's DeviceNet interface boards are configured to allow retrieval of the MAC ID from EEPROM memory. For other welders, this setting will set the Mac ID of the DeviceNet interface. If this value is altered, the Power Wave must be reset (cycle power) in order for the change to become effective.

8.2.2.2 Baud Rate

This field indicates the current configuration of the Power Wave's DeviceNet Baud Rate. For the PW455, PW455M, ACDC1000, and PW655 and welders that use the K2436-1 Ethernet/DeviceNet Communication Interface,, this value will only change if the DIP switches on the Power Wave's DeviceNet interface boards are configured to allow retrieval of the Baud Rate from EEPROM memory. For other welders, this setting will set the Baud Rate of the DeviceNet interface. If this value is altered, the Power Wave must be reset (cycle power) in order for the change to become effective.

8.2.2.3 Analog Input Channels/Hysteresis

These values indicate the magnitude of change that must occur on the first three polled I/O analog DeviceNet channels before the Power Wave will respond to the change. In the case of a command value that is sourced from an A/D whose output may dither slightly, this configuration prevents unintended parameter changes. This attribute is not useful for command values whose source is completely digital and should be set to 0. One exception is when the Power Wave has an Analog Interface module, in this case set these values to a 30. Input channels will be ignored if their Active boxes are unchecked in which case the Power Wave will assign default values to the associated parameters.

8.2.2.4 Interface Support

This item will only appear for ACDC1000SD machines. This item sets how the DeviceNet interface behaves. The two available options are "Standard" and "Legacy AC/DC 1000". Using the "Standard" option will have the DeviceNet interface operate like a standard "Mig" interface does and the DeviceNet master must initialize all Sequencer state items. Using the "Legacy AC/DC 1000" option will have the DeviceNet interface operate like an AC/DC1000 DeviceNet interface where certain Sequencer state items are fanned out to other states, duplicating what was done in the older AC/DC1000 DeviceNet interface.

8.2.2.5 Enable Passive Mode Operation

If checked, then the DeviceNet polled inputs will have no effect on the system except for the Weld Output disable bit and the Production Monitoring Fault Reset bit. Enable this when the DeviceNet connection is used only to monitor system operation.

8.2.2.6 Restore Settings from Memory on Reset

DeviceNet will automatically restore weld schedule values on power-up that are not accessible from a polled connection. These include Weld Mode, strike, restrike and cold inch wire feed speeds, and times for preflow, postflow and burnback. If the system contains an UI with memory a memory panel or a robot/PLC that restore settings on power up, do not check this box.

8.2.2.7 Fault if No Polled Connection Detected

Disables welding if a polled DeviceNet connection is not present. Check this when a DeviceNet master controls the machine.

8.2.2.8 Workpoint Input

This indicates whether the values passed to the system through the analog DeviceNet channels for the Workpoint parameter are raw values or scaled engineering values. Selecting the "Engineering Units" option indicates that scaled engineering values for Workpoint will be passed across the analog DeviceNet channel. For example when the workpoint is in Inches per Minute and scaled engineering units are used, then a value of 50 to 800 might be expected to be commanded on the DeviceNet analog input for the workpoint. This would represent a value of 50 to 800 inches/per minute. When the "Unscaled Values" option is selected, the commands for Workpoint range from 0 to 32767 corresponding to the minimum and maximum workpoint of the selected weld mode. For most applications, Engineering Units is normally selected.

8.2.2.9 Trim/Wave Control Input

This indicates whether the values passed to the system through the analog DeviceNet channels for the Trim and Wave Control parameters are raw values or scaled engineering values. Selecting the "Engineering Units" option indicates that scaled engineering value for Trim or Wave Control 1 will be passed across the analog DeviceNet channels. For example when the Trim is in volts and scaled engineering units are used, then a value of 75 to 520 might be expected to be commanded on the DeviceNet analog input for the trim. This would represent a value of

7.5 to 52.0 volts. When the "Unscaled Values" option is selected, the commands range for Trim and Wave Control 1, 2, 3, 4 range from –32768 to 32767 with 0 representing a nominal value. A great majority of applications will require Trim and Wave Control command values to be set near the nominal value.

8.2.2.10 Report Trim/Wave Outer Process Limits

When the Trim and Wave are being reported in Engineering Units and these inputs are depended on the workpoint, then this item is used to determine how to report back the trim and wave high and low limits. If the above conditions are meet, then checking this box will have the absolute high and low limit always be returned, unchecking the box will have the returned limits be based on the workpoint. As the workpoint changes, the acceptable range that the trim and waves can be in will change as well, unchecking this box will have the limits report back what this range is. Normally this item is checked.

8.2.2.11 TAST Update Frequency

This parameter is used for Through the Arc Seam Tracking. The lower the number the more often the feedback is updated, but higher the system load on the boards. If Through the Arc Seam tracking is being used, then this is usually set to a value of 10 to 20, otherwise a value of 100 is usually acceptable. This value is only relevant for the PW455, 455M, 655, 355, and ACDC1000.

8.2.2.12 Meter Time Constant

This parameter sets the filtering of the feedback data. The default value of 400 is usually used unless Through the Arc Seam Tracking is being done, then this item is usually set to a value of around 75. This value is only relevant for the PW455, 455M, 655, 355, and ACDC1000.

8.2.2.13 Analog Scans between Updates

This determines how often the analog input channels (workpoint, trim, and wave control) update the system in terms of Polled I/O scans. For example a value of 50 means that every 50th I/O scan will be accepted. The setting of this item depends on how often the Power Wave is scanned. For systems with a scan rate of 200 or more, then the default of 50 is usually acceptable. For systems with very low scan rates, such as 10 Hz, a setting as low as 2 might be needed. Once a DeviceNet connection has been established, see IO Scans/Sec item in the DeviceNet monitor screen in Observer for the current scan rate. Note that this setting does not affect the digital I/O bits updating rate.

8.2.2.14 Cold Inch Wire Feed Speed

This parameter sets the feed speed of the wire while cold inching or jogging the wire. This value is used for either cold inching forward (Jog +) or cold inching reverse (Jog -). This value is in units of IPM.

8.2.3 Monitor

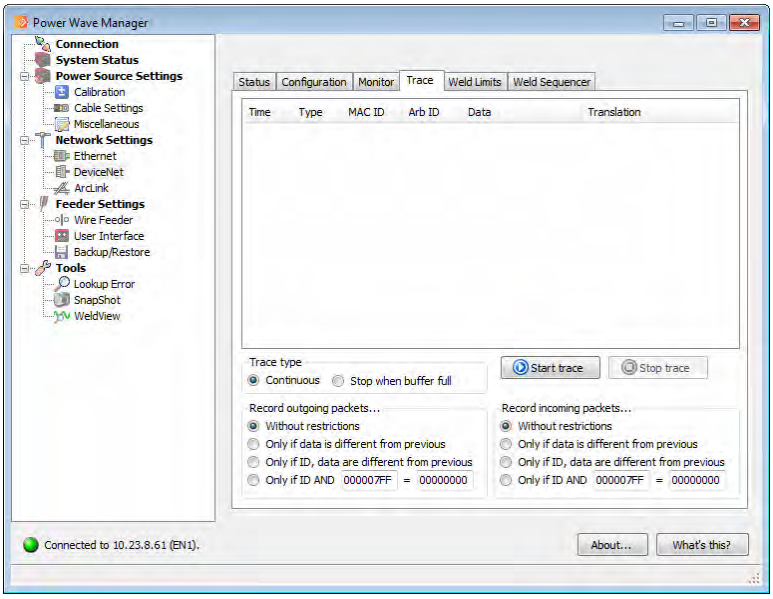
This tab contains detailed information about the polled I/O data coming to and from the Power Wave's DeviceNet interface. This is a troubleshooting tool for those customers implementing a DeviceNet connection to the Power Wave. Refer to the DeviceNet Interface Specification for further information.

8.2.4 Trace

This tab allows you to record a trace of DeviceNet network traffic coming to and from the Power Wave's DeviceNet interface.

You may select from several configuration options, including whether to run the trace continuously or stop when the internal buffer is full, and whether to filter incoming or outgoing packets based on data contents or arbitration ID.

Click the "Start trace" button to inform the interface to begin capturing DeviceNet messages. Click "Stop trace" when finished recording. The recorded messages will be downloaded from the DeviceNet module and displayed in the list, with all relevant fields decoded.

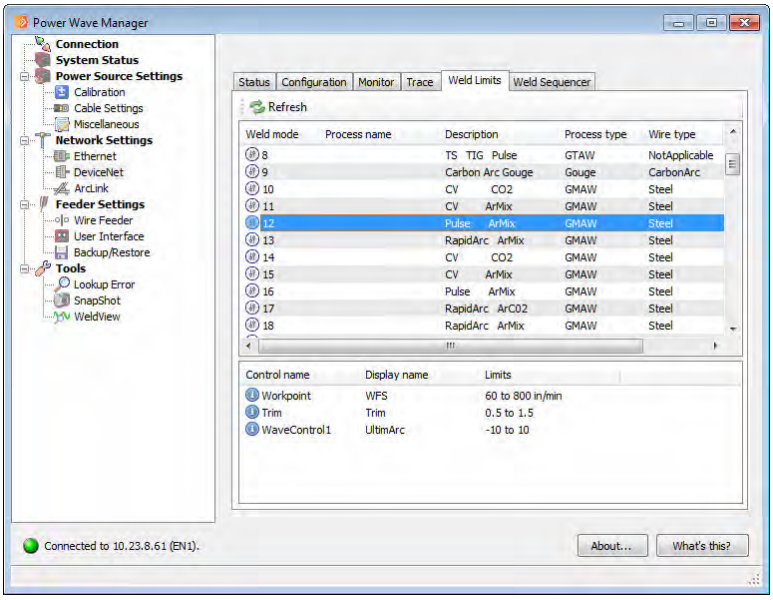


8.2.5 Weld Limits

This tab displays a list of all available weld procedures supported by the Power Wave, and basic information for each procedure.

Click on a procedure to view the types of controls associated with the procedure (Workpoint, Trim, Wave Control, etc.), and the outer limits of each control. This section can be used to verify that the correct weld mode information is being read over the DeviceNet connection.

Note: Updating the machine's firmware may cause the limits of some procedures to become different.



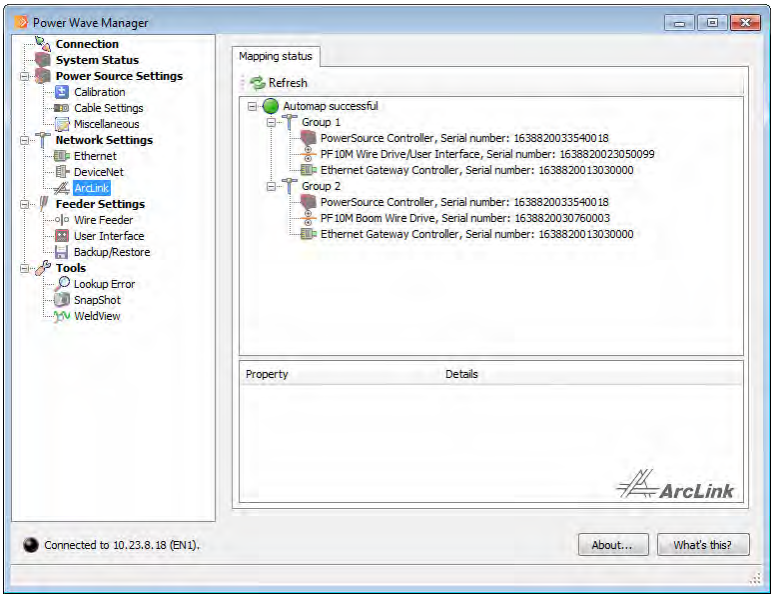
8.2.6 Weld Sequencer

This tab contains advanced configuration settings for the Weld Sequencer component of the system. It presents an array of sequencer-controlled system attributes, grouped by welding state. Double-click on one of the cells to modify a system variable in a certain state. This section can be used to verify that writes over DeviceNet are going to the correct locations.

8.3 ArcLink

This section shows an overview of the logical layout (or "mapping") of the welding system's ArcLink network, which is the internal protocol used by the individual modules in the system.

Some systems can be configured to map automatically or manually. The display shows the current mapping of the system, and whether it is mapped automatically or manually.

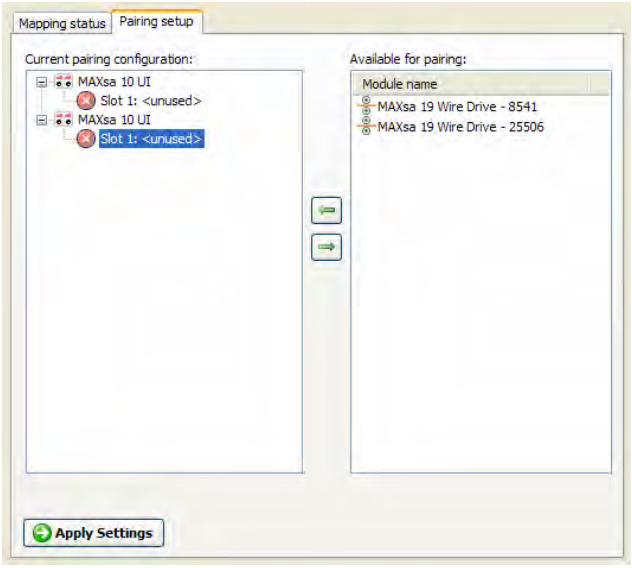


8.3.1 Pairing Setup

Certain Lincoln components can be "paired" together, such as certain models of wire feeders and user interfaces. These components are usually paired automatically and transparently to the user. However, if there was a problem with pairing between two or more components, this section of Power Wave Manager will show a "Pairing" tab where components can be paired manually.

Each module that requires one or more other modules to be paired with it will be shown in the list on the left, with "slots" that can be filled by modules from the list on the right. Click on an unused slot to see which modules can be paired with it. Then, select the correct modules from the list on the right, and drag-and-drop it over to the unused slot, or use the arrow buttons in the middle.

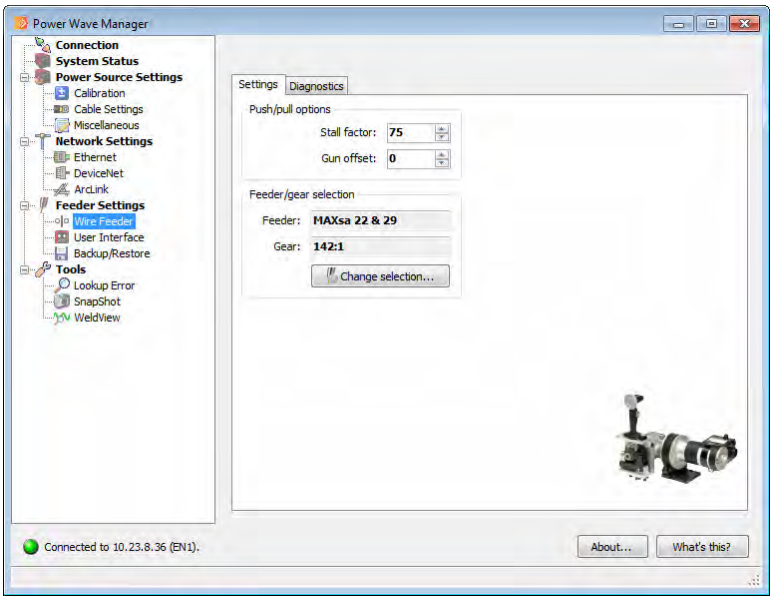
When finished all of the required modules, click the "Apply Settings" button.



9 Feeder Settings

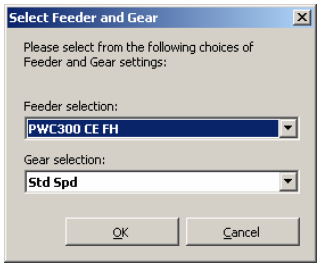
This section allows you to configure a multitude of parameters related to the wire feeder and user interface of the machine (if available).

9.1 Wire Feeder



The Wire Feeder section contains settings and diagnostic information about any wire feeders that are attached to the welding system.

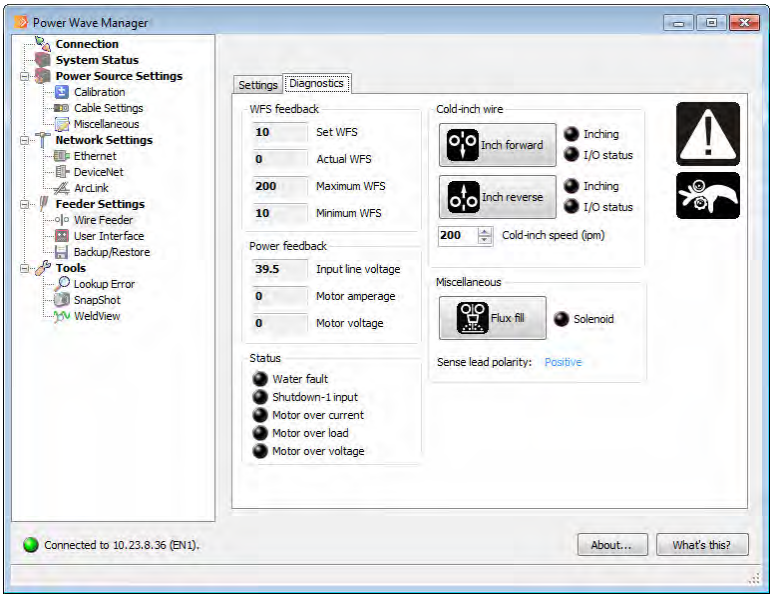
Under the "Settings" tab, you can change the feeder and gear type selection, as well as stall factor and gun offset for push-pull operation. The feeder and gear selection appears only for feeders that support custom selections. Clicking on the Change selection button will bring up a window like below:



Select the Feeder and Gear from the listed items and then click on the OK button to change the setting.
Note: The feeder/gear selection settings will not be shown if your feeder requires its selection to be set up using DIP switches.

The "Diagnostics" tab can be used to troubleshoot and verify the operational state of your feeder. The tab is separated into the following items:

- **WFS feedback** – Used to verify wire feed settings.
- **Power feedback** – Used to verify feed ability of system.
- **Cold-inch wire** – Used for testing feeding of wire without welding.
- **Miscellaneous** – Used to verify gas purge (or flux fill for submerged arc systems) and voltage polarity settings.
- **Status** – Displays any faults in the currently selected feeder.



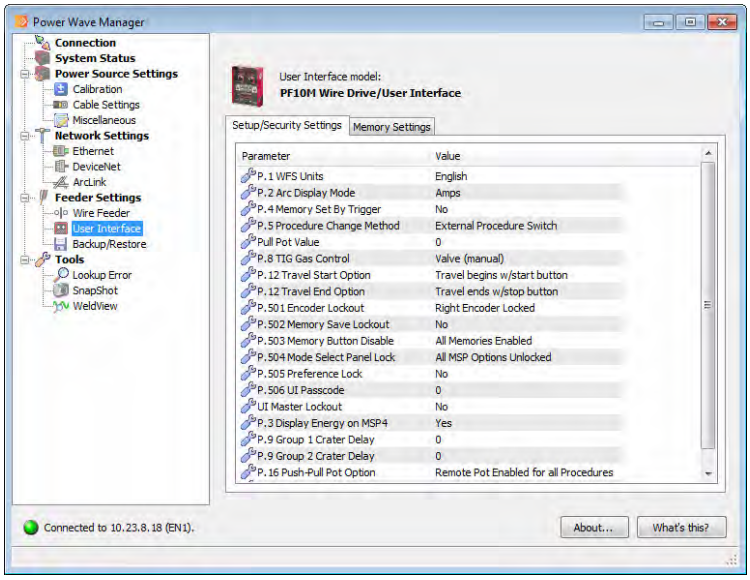
9.1.1 Multiple Wire Feeders

If the system to which Power Wave Manager is connected contains more than one wire feeder module, the different modules will show up as a pull-down list at the top of the Wire Feeder section. Switch between the pull-down selections to configure settings for each module.

To identify which of the multiple modules is currently selected, click the “Blink status light” button. This will cause the status light of the selected module to start blinking rapidly, so that it could be visually identified.

9.2 User Interface

This section contains settings that pertain to the User Interface of the welding system, if one is present.



9.2.1 Setup/Security Settings

The Setup/Security section allows the user to modify several User Interface parameters and security settings.

The configurable parameters will be shown in a table, as shown in the illustration. Each parameter can be changed by double-clicking it. After double-clicking on a certain parameter, Power Wave Manager will display a window where the new value for the parameter can be entered.

There are two different types of parameters: numeric (where the value can be a number within a certain range), and selectable (where the value can be selected from one of several text descriptions).

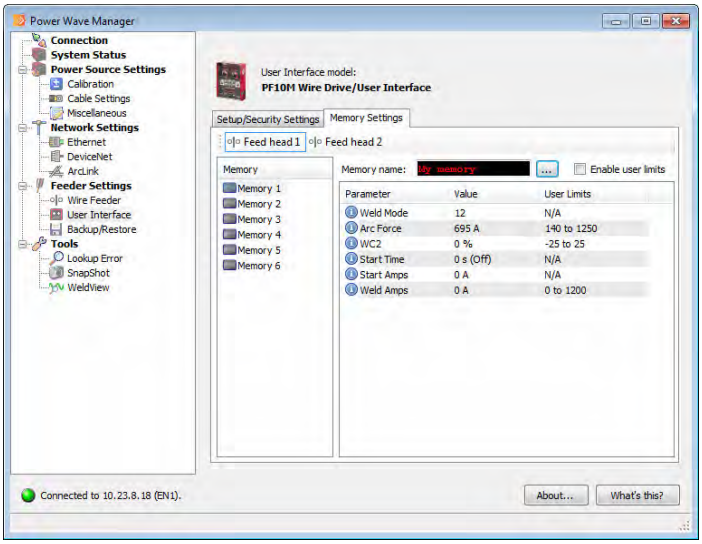
When changing a certain parameter, Power Wave Manager brings up the appropriate window for changing the setting based on its type. For selectable parameters, the window will contain a drop-down box with the possible selections for the parameter. For numeric parameters, the window will contain a text box where the value can be entered directly.

Different models of Lincoln user interfaces may give a different list of configurable parameters, since different models may support varying sets of features.

To obtain help with a particular setup parameter, click the “What’s this?” button at the bottom right corner of the window, then click on the parameter for which you would like more information. A small window will pop up that contains a detailed description of the specified parameter.

Selected user interface module:
PF25M User Interface
Blink status light
User Interface model:
PF25M User Interface
Setup/Security Settings
Memory Settings
Parameter
Value
P.1 Wire Feed Speed Units
English
P.2 Arc Display Mode
Amps
P.3 Display True Energy
No
P.4
P.4: Recall Memory with Trigger
Allows the operator to recall a memory by quickly pulling and releasing the gun trigger. To recall a memory, quickly pull and release the trigger the number of times that correspond to the memory number. For example, to recall memory 3, quickly pull and release the trigger 3 times. To recall memory 1, quickly pull and release the trigger the number of user memories plus 1. Memories cannot be recalled while the system is welding. A memory panel must be installed in order to use this feature.
About...
What's this?

9.2.2 Memory Settings

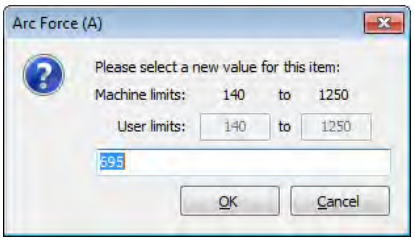


The Memory Settings section allows the configuration of any parameter stored within any of the memory slots (accessible by memory buttons) of the User Interface.

If the User Interface is a dual feed head system, select the feed head to configure by clicking on the appropriate Feed Head button on top.

Select which memory to configure by clicking the appropriate memory item (Memory 1, Memory 2, etc.) The list of parameters corresponds to the currently selected memory item.

To change the "name" of the current memory, click the "…" button next to the name box and enter the new name for the memory. This will be the name that is displayed on the Mode Select Panel of the User Interface when this memory is selected.



To change any of the parameters in the list, double-click on the desired parameter. This will bring up a window where the new value for the parameter can be entered. Certain parameters also have configurable user limits. These limits can also be configured from this window. The "Machine Limits" displayed below the parameter value represent the "absolute" limits of this parameter. The User Limits, as well as the Value, must be within this range. When finished modifying the parameter, click OK to accept the changes and write the new settings to the machine.

The "Enable User Limits" check box in the Memory Setup section informs the machine whether or not to actually enforce the User Limits defined for certain parameters. If this is not checked, the User Limits will have no effect.

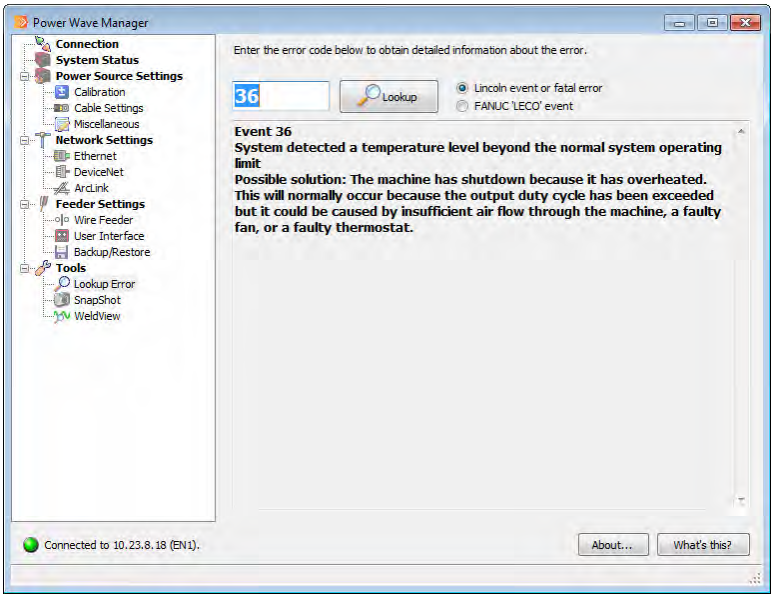
9.2.3 Multiple User Interfaces

If the machine is connected to more than one user interface, the User Interface section will provide a drop-down selection at the top of the screen to select which User Interface is to be configured.

To identify which of the multiple modules is currently selected, click the "Blink status light" button. This will cause the status light of the selected module to start blinking rapidly, so that it could be visually identified.

10 Tools

10.1 Lookup Error



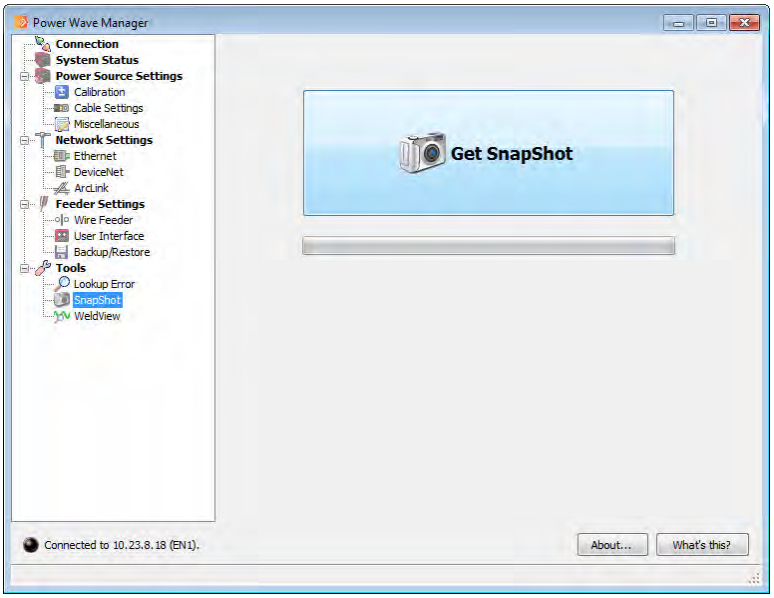
The Lookup Error section allows you to obtain information about any error code given by a Lincoln Electric machine, or error codes given by a FANUC robot controller regarding a Lincoln power source. When a welder is in a faulted condition, it will flash out an error code on it's Status LEDs; see the welders operator manual for how to interpret the Status LED.

To look up a certain error code, select what type of error it is by clicking one of the two checkboxes, then type in the error number in the text box, and click the Lookup button.

A description of the error will be shown, as well as a possible solution or possible course of action to resolve the error.

This section can be accessed without connecting to a Power Wave, so that error information can be acquired at any time.

10.2 SnapShot



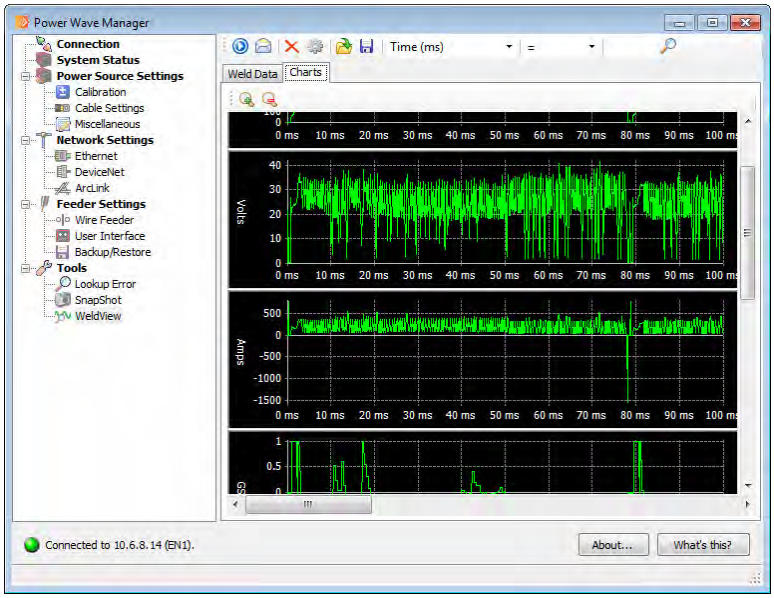
A SnapShot is a small file that contains very detailed configuration and debugging information collected from each module in the Power Wave.

This file can be sent to Lincoln Electric Support to troubleshoot any possible issues that cannot be easily resolved by the user.

To obtain a SnapShot of the Power Wave, click the "Get SnapShot" button, and select a location on your computer where the file will be saved. When the file is saved, it can be e-mailed to Lincoln Electric Support for analysis.

When a problem or issue occurs, it is recommended to record a SnapShot of the machine, then clear the logs (in the System Status section), then attempt to reproduce the issue. If the issue is reproduced, record another SnapShot, and send both SnapShots to Lincoln Electric Support for analysis.

10.3 WeldView



WeldView is a feature of Power Wave Manager that allows you to capture a high-speed trace of a portion of a weld performed by your Power Wave.

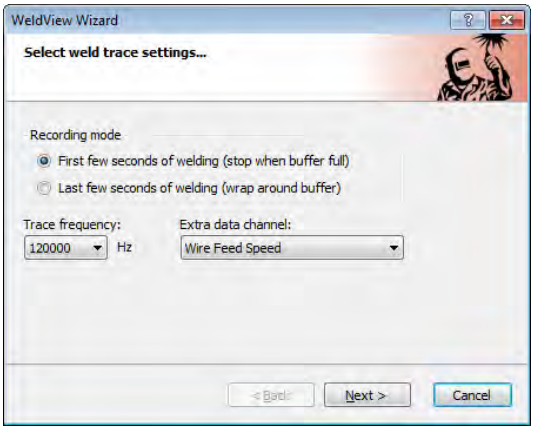
The trace is a series of data points that the machine stores while welding. Each record consists of several variables, including Amperage and Voltage at the time that the record was written.

The weld trace can be used to troubleshoot or fine-tune welding performance by examining the waveform of the weld during starting and ending.

A weld trace may also be requested by Lincoln Electric Service personnel to aid in resolving welding issues. The trace can be saved to a file and sent to Lincoln Support for evaluation.

The WeldView section can be accessed without connecting to a Power Wave, so that previously saved weld traces can be reviewed at any time.

10.3.1 WeldView Wizard



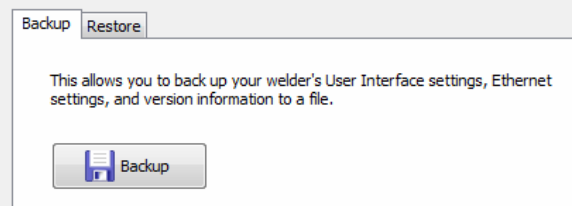
To capture a weld trace, click the WeldView Wizard button at the top left of the section.

The WeldView wizard allows you to fully configure the trace before starting it, including the frequency, triggers, or extra channels to record with the trace. Follow the on-screen instructions in the Wizard to proceed.

The last step of the Wizard will wait until a weld is completed with the Power Wave. This will be the weld that is recorded in the trace. When the weld is completed, WeldView will download the trace data from the machine and display it in the table and charts.

10.4 Backup/Restore

The Backup/Restore section allows the user to save Power Wave settings (memory configuration, lockout parameters, and network settings) to a file, and then restore the saved settings at a later time to the same, or to a different, Power Wave.


Backup
Restore
This allows you to back up your welder's User Interface settings, Ethernet settings, and version information to a file.
Backup

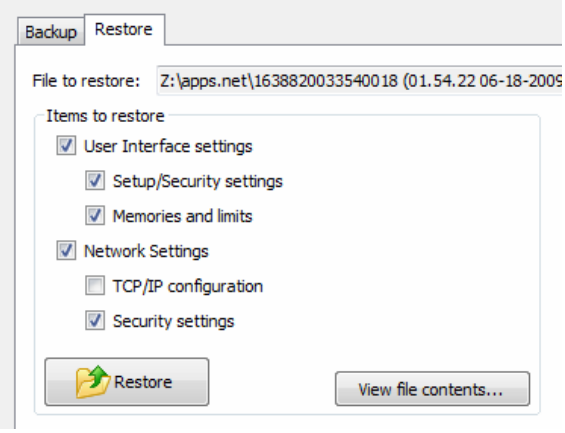
10.4.1 Backup

To create a backup of the currently-connected Power Wave, switch to the Backup tab, then click the Backup button. The program will ask for a location and name to be given to the new file. Power Wave Manager initializes the file name with the serial number of the machine's control board plus the current date and time. Once the file name is selected, backing up will begin, and will take a few moments.

10.4.2 Restore

To restore a saved backup file onto the currently-connected machine, switch to the Restore tab and click the Browse button to find the desired backup file, or simply drag-and-drop the backup file into Power Wave Manager.

Next, select the various settings that should be restored from the backup file. These settings are User Interface Settings, which includes Setup/Security Settings and Memory and Limit settings, and Network Settings, which includes TCP/IP Configuration and Security Settings. If a certain set of settings should not be restored to the current machine, leave the corresponding check box unchecked.



***Note**: Use caution when restoring TCP/IP configuration. Since only one machine can have a specific IP address on the network, restoring an IP address to more than one machine can cause problems on the network. It is recommended to restore TCP/IP configuration only to the machine from which it was originally backed up. After an IP address is restored, the machine must be reset in order for the setting to take effect.*

The Backup/Restore section can be accessed without connecting to a Power Wave, so that the contents of a backup file can be viewed at any time.

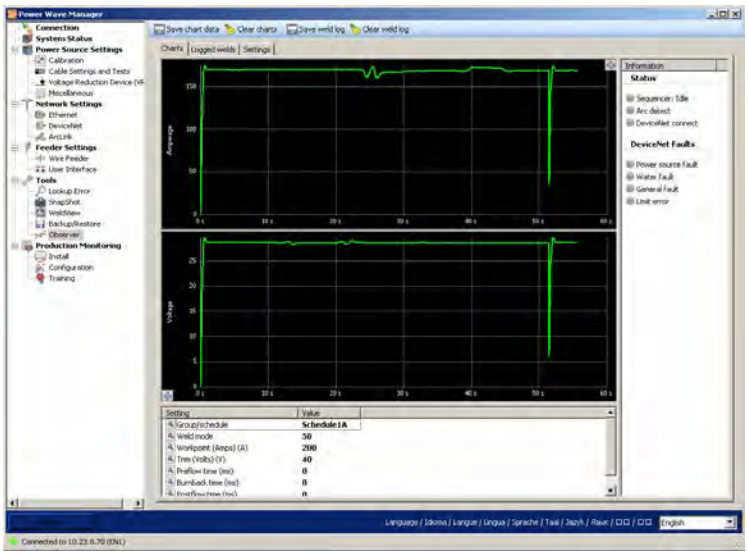
10.4.3 Viewing File Contents

The contents of a backup file can be viewed without restoring it to the machine. After a backup file is opened or dragged onto Power Wave Manager, click the View File Contents button. This will display a window where the backed up information can be browsed. The browsing is nearly identical to working in Power Wave Manager online with the machine, except that no parameters can be modified.

10.5 Observer

While WeldView gives a detailed view of a portion of a weld with a short duration, Observer graphs welding feedback at a slower rate over the course of several entire welds. It also allows changing of basic welding parameters including the weld mode, workpoint, and wave control values.

10.5.1 Charts



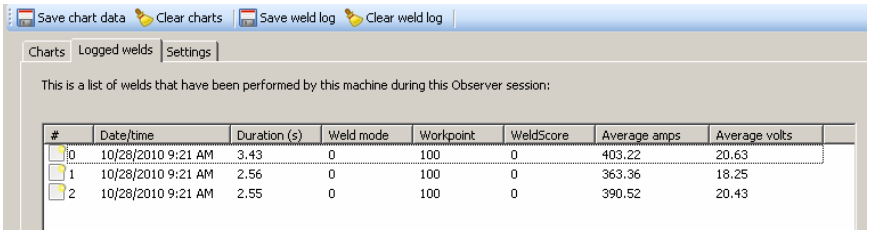
The plots are produced by periodically reading feedback values from the machine while it is welding, as shown in the figure on the right. The data is updated whenever the machine output is on. It is possible to view amperage, voltage, wire feed speed, WeldScore™ (if available), and global scale factor. To save the data in the charts to a tab-delimited text file, click the "Save chart data" button in the toolbar at the top of the screen. The charts can be cleared by clicking the "Clear charts" button.

To change one of the welding values listed in the Setting box, double-click the value and enter the desired value in the resulting dialog.

The sidebar on the right side of the screen shows the status of various system components. If there is a fault, the respective gray dot will become red.

10.5.2 Logged Welds

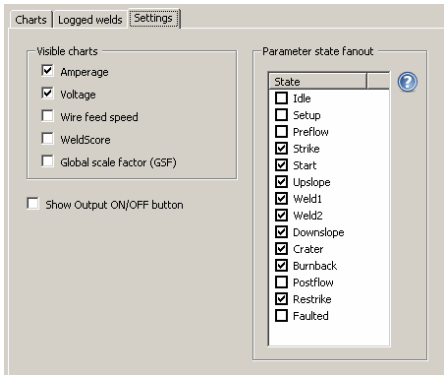
The Logged Welds screen displays a list of the welds that have been made during the Observer session. For each weld the date/time of the weld, weld duration, weld mode, workpoint, WeldScore™, and average amperes and volts are listed. A new weld appears in the list when the machine's output turns off after the weld is completed. To save the log to a tab-delimited text file, click the "Save weld log" button in the toolbar the top of the screen. To clear the log, click the "Clear weld log" button.


Save chart data
Clear charts
Save weld log
Clear weld log
Charts
Logged welds
Settings
This is a list of welds that have been performed by this machine during this Observer session:

#	Date/time	Duration (s)	Weld mode	Workpoint	WeldScore	Average amps	Average volts
0	10/28/2010 9:21 AM	3.43	0	100	0	403.22	20.63
1	10/28/2010 9:21 AM	2.56	0	100	0	363.36	18.25
2	10/28/2010 9:21 AM	2.55	0	100	0	390.52	20.43

10.5.3 Settings

The Settings tab allows you to change which signals are visible in the graphs, whether an output on/off button is displayed, and the parameter state fanout (i.e. which weld sequencer states are modified when you change a welding setting such as workpoint or trim).

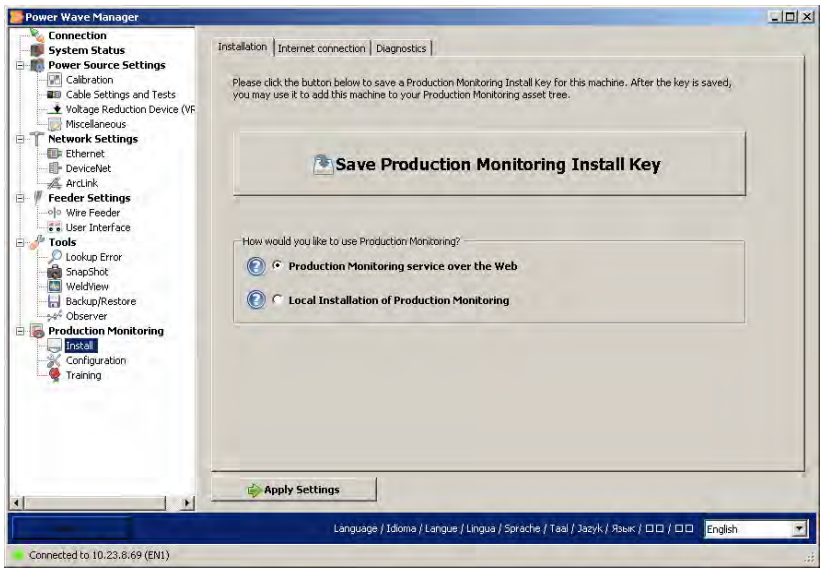


To choose which charts are visible, select the desired charts using the checkboxes in the "Visible charts" box. Note that if you add a new chart after welds have been logged, the data displayed in the new chart for the old welds may not be valid.

If you want to control the machine's output from within Power Wave Manager, check the "Show Output ON/OFF button" option. A button will appear in the toolbar allowing the machine output to be turned on or off. For safety, you must press and hold the Control key on the keyboard while clicking the button in order for it to turn the machine on or off. **Use caution when controlling the output from Power Wave Manager.**

11 Production Monitoring™

Production Monitoring™ is a technology available in some Lincoln Electric Power Wave® power sources. This is a collection of features that allow the collecting of welding logs and gathering of statistics, saving of weld profiles, sending emails, and tracking consumable usage and providing low package warnings. For more information, refer to the *Production Monitoring 2.1 User Manual*, available from Lincoln Electric.



Power Wave Manager is used to assist in installing Production Monitoring™, setting up weld profiles and limits, training for WeldScore™, and backing up and restoring information.

11.1 Install

This section is used to create an install key that is used to install a welder into Production Monitoring™ 2.1. Before this step is done, make sure the welder has the correct IP. If the welder is connected to the network through a robot Ethernet connection, connect to the robot IP. Do the follow steps to create an install key:

- Connect to the machine you wish to install using Power Wave Manager.
- Under "Production Monitoring," select "Install."
- Click the "Save Production Monitoring Install Key" button. A standard Windows "Save file…" window will open.
- Save the file in the desired location.
- The file, which has a .tok extension, can now be imported into the Admin section of Production Monitoring™ to add the welder to the system.

11.2 Configuration

The items in the Configuration section are used to set up Production Monitoring™. These items are discussed in detail in the *Production Monitoring 2.1 User Manual*, and include:

- **Weld Profile Selection** – Used to set up how the Production Monitoring™ profiles are selected.
- **Out of Limits Actions** – Used to set up what action the Power Wave® will take when a weld exceeds the Production Monitoring™ limits for weld duration, WeldScore™, arc current, arc voltage, or wire feed speed.
- **Profile Limits** – Used to select a weld profile and display the limits associated with it.
- **Wire Package** – Production Monitoring™ allows the configuration of the wire package used for welding, so that its usage can be tracked by the Power Wave®, and the user notified when the package begins to run low.
- **E-mail Setup** – The e-mail screen provides access to all of the configuration options for the e-mail feature of Production Monitoring™. This window allows the configuration of e-mail recipients, address book, and e-mail settings.
- **Miscellaneous** – Used to set a Part, Operator, or Consumable serial number in the power source.

11.3 Training

Weld Profile Training is used to automatically generate limits for Time, Voltage, Current, and WFS for a profile. It will also generate the necessary data in order to use WeldScore™. See section 13.1 for more information on Weld Profiles and section 13.2 for more information on WeldScore™.

This feature removes the necessity of setting up limits manually for each of the Weld Profiles allowing the operator to make several "training" welds in the same manner as they would be done in normal production. Then, based on the training welds, Production Monitoring™ automatically generates limits for arc current, voltage, wire feed speed, and time. The operator can remove any welds made during the training that are considered "bad" welds.

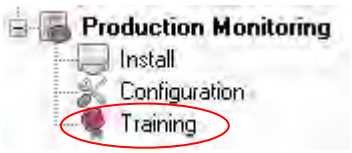
Important: A weld profile must be trained before a WeldScore™ will be given. Note at this time, the longest weld that can be trained for determining WeldScore data is one minute. If training is being done in order to determine Voltage, Current, and WFS limits, then the maximum duration is 21 minutes.

11.3.1 Selecting a Profile

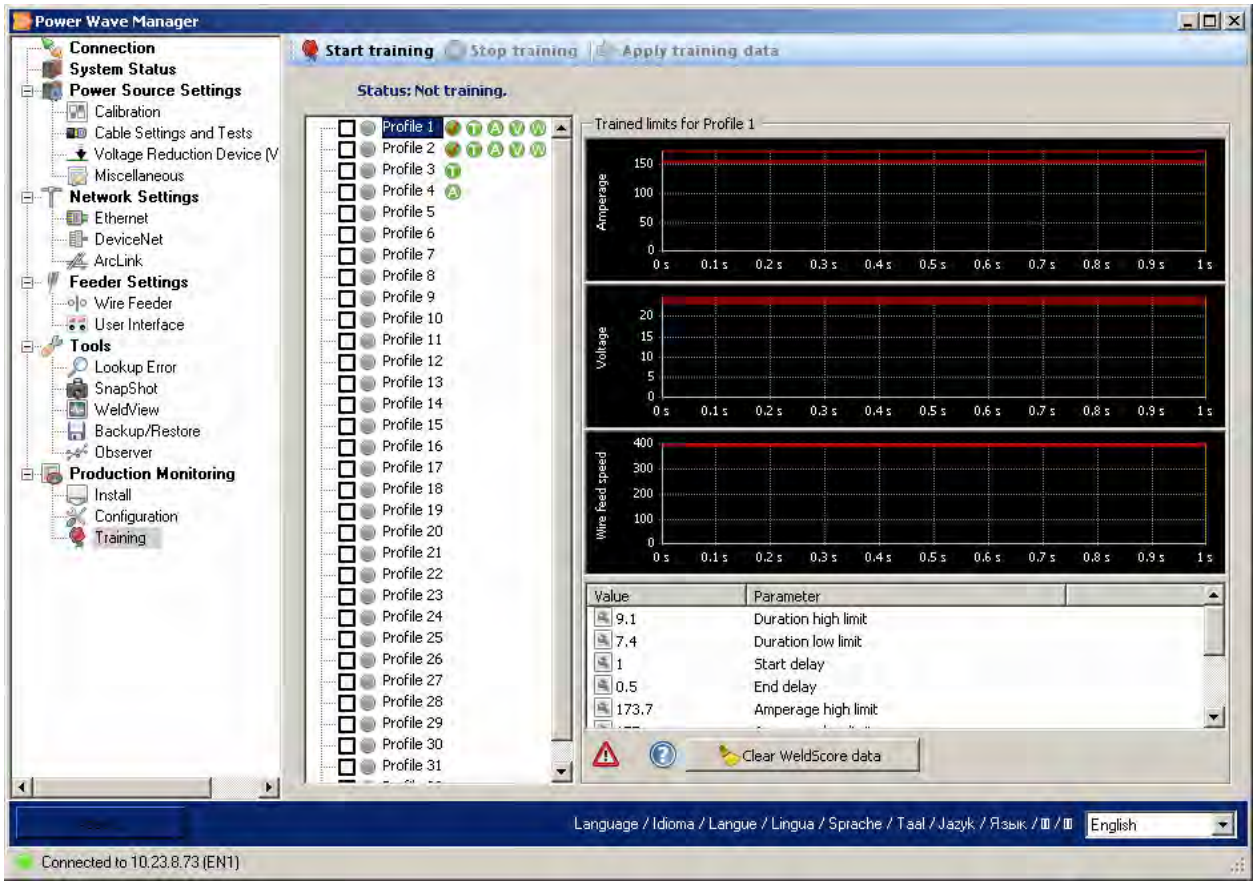
The first step to training a weld profile is to set how a profile will be selected. See the Production Monitoring 2.1 manual, section 4.2.1, Weld Profile Selection Tab, for setting how profiles are selected.

11.3.2 Training a Profile

To begin training, select the "Training" option under "Production Monitoring" in Power Wave Manager.

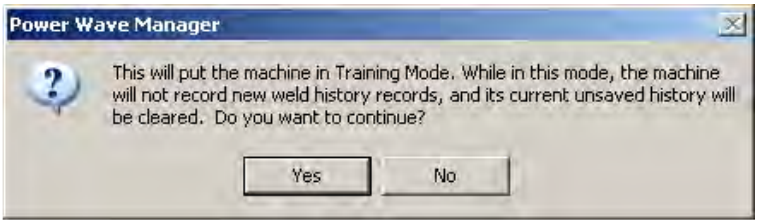


This will bring up a screen that looks like the following:



The green icons next to each profile name indicate which parameters have non-zero limits, where T is time, A is amperage, V is voltage, and W is wire feed speed. These limits can be manually set and do not necessarily mean the profile has been trained for WeldScore™. The checkmark icon indicates the profile contains WeldScore™ data which cannot be manually set, showing the profile has been trained. In the above example, profiles 1 and 2 have been trained and contain WeldScore™ data.

To begin training, verify the weld profile selection has been properly configured and click on the Start training item located at the top of the window. This will bring up the following message:

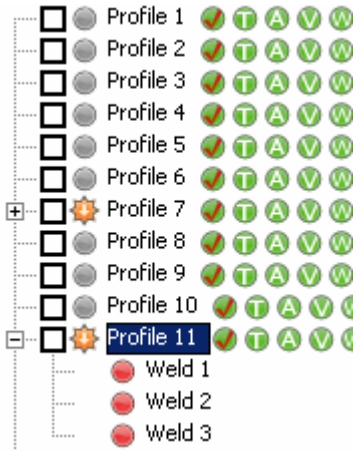

Power Wave Manager
This will put the machine in Training Mode. While in this mode, the machine will not record new weld history records, and its current unsaved history will be cleared. Do you want to continue?
Yes
No

Clicking on yes will cause the Power Wave® to enter training mode and will cause any weld history to be cleared and will prevent any more history collection until the training has completed as the above message indicates. Various profiles can be trained while in this mode. The selected profile can be changed as needed without leaving training mode.

11.3.3 Profile Training Operation

Before a weld starts, the status on the top of the screen will read Status: Waiting for next weld to start... . While welding, it will say Status: Waiting for weld to complete... , and then after a weld is finished it will once again read Status: Waiting for next weld to start... . When a profile has unsaved weld data, the icon next to the profile number will change to a icon.

In the following example, profile 7 has new weld data but the individual welds are hidden.
Clicking on will show the welds. Profile 11 also has new weld data, and the individual welds are showing.
Clicking on will hide the welds.



None of the other visible profiles have new weld data, as signified by the icon.

11.3.4 What Welds to Train

WeldScore™ works by comparing production welds to welds that have been trained. In order for an accurate score to be assigned, it is recommended to train at least 5 welds at each allowable production extreme. For example, if the electrical stickout is allowed to vary from $\frac{5}{8}$" to ¾", then train 5 welds at each of these stickouts. Only train the *allowable* extremes; if the stickout may be able to increase to 1.0" but this causes a bad quality weld, do not include this in training. The purpose of training is to show the Power Wave® the types of welds considered acceptable.

11.3.5 Deleting a Weld from Training

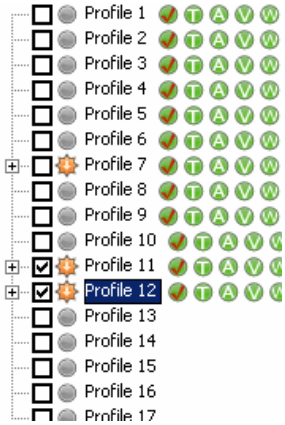
If there was a problem with a weld during training, it can be deleted from the profile before training data is saved. To delete a weld, expand the profile by clicking on the icon next to the profile being trained. Then right click on the desired weld to delete. Now a popup menu will appear, containing the following option:

Click on this choice and the weld will be deleted from training.

11.3.6 Saving Training Data

When all of the training welds have been completed, click on the Stop training button. The status will now change to Status: Not training. . Check the boxes next to each of the profiles to be saved. Not all the profiles that had training welds taken need to be checked. After the appropriate boxes are checked, click on the Apply training data button.

For example, the below section shows that welds were trained for profiles 7, 11, and 12 as indicated by the icon. But since only profiles 11 and 12 are checked, these are the only profiles settings that will be saved.



11.3.7 Clearing WeldScore™ Training Data

To clear WeldScore™ training data for a profile, select the profile and click on the "Clear WeldScore™ data" button. The icon next to the profile number will disappear.

Clicking this button tells Power Wave Manager that WeldScore™ data is going to be cleared, but does not send the command to the Power Wave® to erase it. To do that, the profile must be saved by checking the box next to the profile and clicking on the Apply training data button. If training data is not applied, WeldScore™ data will not be cleared and the icon will reappear next time the profile screen is loaded in Power Wave Manager.

12 Language Selection

Power Wave Manager has built-in support for multiple languages in its user interface. The following languages are presently supported:

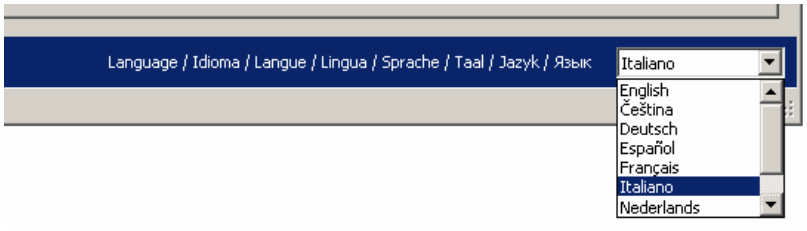
- Chinese (Simplified)
- Czech (Čeština)
- Dutch (Nederlands)
- English
- French (Français)
- German (Deutsch)
- Italian (Italiano)
- Japanese (日本語)
- Polish (Polski)
- Portuguese (Português)

- Russian (Русский)
- Spanish (Español)

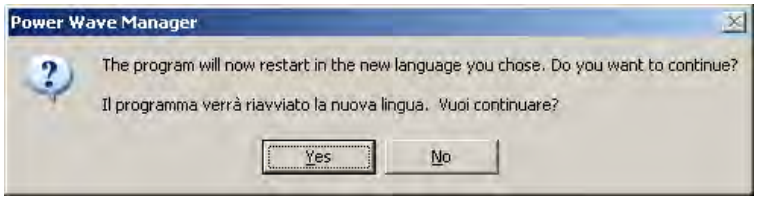
Other languages may be included in future releases.

By default, the program automatically detects the language used by the operating system, and switches the language of its user interface accordingly. For example, on a Japanese installation of Windows, Power Wave Manager will automatically switch to using Japanese text and messages.

If you would like to change the language used by Power Wave Manager, select the appropriate language from the box in the lower right-hand corner of the screen:



You will be prompted to confirm your choice before continuing:


Power Wave Manager
The program will now restart in the new language you chose. Do you want to continue?
Il programma verrà riavviato la nuova lingua. Vuoi continuare?
Yes
No

13 Additional Information

13.1 Weld Profiles

One of the features of Power Wave Manager is the ability to see and set limit data for voltage, current, wire feed speed, duration, and WeldScore™. These parameters can vary widely from weld to weld. The concept of weld profiles allows the Power Wave® to store this data for up to 32 different welds. The Power Wave® can then compare the limits stored in a weld profile to the real time data values while performing a weld and take various actions if these limits are exceeded.

As an example, consider a part that requires 10 different welds for proper assembly. The user will begin by configuring 10 of the 32 programmable Weld Profiles, with proper limit settings for each of the different welds. The user can then begin welding the part, selecting the proper profile for each of the 10 welds.

When the Power Wave® is trained to use WeldScore™, the taught welds are stored in a weld profile. The same profile must be selected when teaching a weld as when performing a weld to receive the proper WeldScore™.

13.2 WeldScore™

WeldScore™, a new feature available in all third generation Power Wave® models including the i400, C300, S350, R350, and AC/DC 1000 SD, can be used to assist a weld quality control program. It assigns a score to welds on a 0-100% scale that indicates the quality of the weld. The score is based on a comparison to previously trained welds. Any weld with a score of 90 or above can be considered with a reasonable amount of confidence to be a good weld. This is not a guarantee of quality and is not intended to replace a quality control system. WeldScore™ can be used independent of or together with Production Monitoring™ 2.1 or newer.

13.2.1 How It Works

Traditional weld monitoring systems measure voltage and current and must then guess what the power supply is trying to do before attempting to determine how well it is actually doing it. WeldScore™ is built right into the power supply controller which gives it a significant advantage in that it removes the guesswork involved with how the supply should be functioning. In addition to traditional voltage and current measurements, WeldScore™ also looks at 40-50 additional variables which help to make it more reliable and accurate than any previous weld monitoring system.

In order to assign a score, the Power Wave® must first be taught what is considered to be a good weld. This is done through the training section of Power Wave Manager. When a score is assigned to a future weld, it is done by comparing it to the taught weld. Therefore, it is necessary to teach the Power Wave® every weld that a WeldScore™ is desired for. Some examples of when new training is required include changes in wire feed speed, voltage, joint type, travel speed, or position.

WeldScore™ is able to accommodate both welds with very tight tolerances and welds that have some acceptable process variation. If the welds taught to the Power Wave® all have very little variation, then the only welds that will receive a passing WeldScore™ are ones that meet that very tight tolerance. Likewise, if there is room for some variation (ex. Changes in electrical stickout or work angle) and the acceptable variations are used in the teaching process, then WeldScore™ will assign passing scores to welds that fall within those variations.

13.2.2 Where to Use It

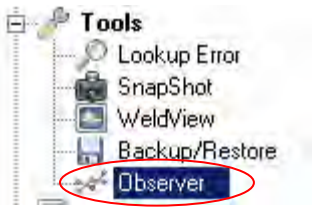
WeldScore™, like any statistical analysis, requires a controlled process. It will produce the most accurate results with single pass welds or welds with a small number of passes because as more passes are used, the process inherently becomes less repeatable. If there are a large number of variables that are allowed a significant amount of variation, the criteria may be too broad for the WeldScore™ to be a meaningful value.

13.2.3 What the Score Means

An instantaneous WeldScore™ value is calculated every 0.25 seconds. The average of these scores over the entire weld is reported as an overall score in Production Monitoring™. A weld may receive a passing overall score if there is only a problem for a short portion of the weld time. For example, if a 50 inch weld has a score of 95 for 49 inches, but a score of 45 for the last inch, the overall score will be a 94. Out of limit error reporting is calculated over a user-defined moving window of time. This means that even a weld with a good overall score will cause an error to be reported if the WeldScore™ falls out of bounds for this defined amount of time.

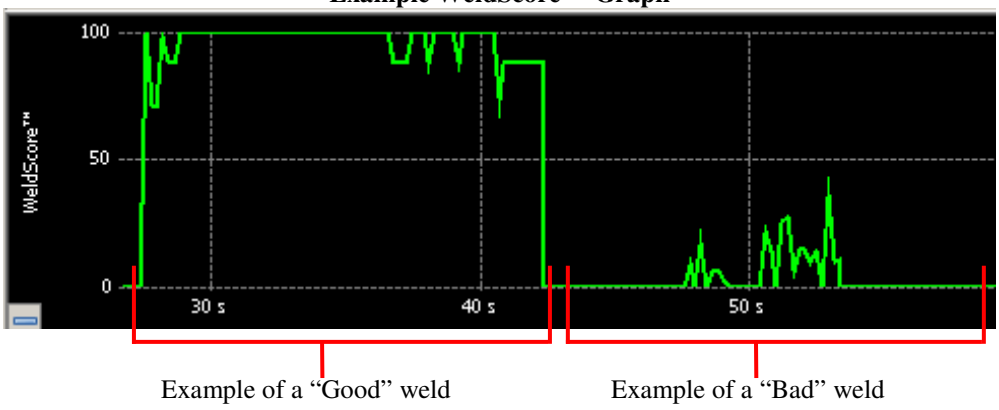
13.2.4 Viewing Using Observer

Once a profile has been trained, WeldScore™ data can be viewed in Power Wave Manager by selecting the "Observer" option under "Tools."



Select the appropriate weld profile using one of the three options described previously and begin a weld. A real-time view of amperage, voltage, wire-feed speed, and WeldScore™ can be graphed under the "Charts" tab in the observer window. The "Settings" tab allows selection of which items will be graphed. For more information about the Observer function of Power Wave Manager, see section 9.4 of this manual.

Example WeldScore™ Graph



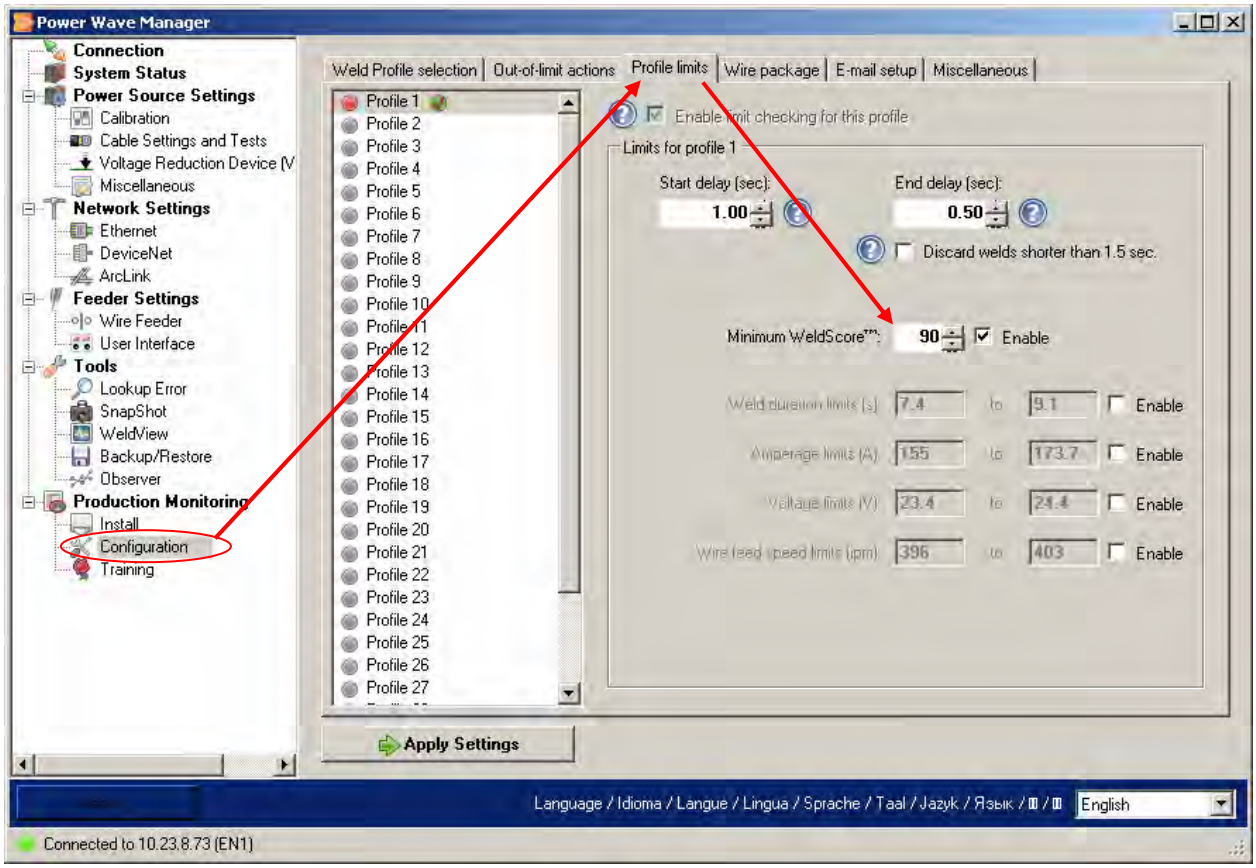
The overall WeldScore™ can be viewed under the "Logged welds" tab as the following example shows.

#	Date/time	Duration (s)	Weld mode	Workpoint	WeldScore	Average amps	Average volts
0	10/5/2010 8:52 AM	11.41	12	400	81.3	172.47	23.72
1	10/5/2010 8:52 AM	0.22	12	400	81.3	0.1	38.2
2	10/5/2010 8:53 AM	14.63	12	400	40.8	178.56	23.97
3	10/5/2010 8:54 AM	15.47	12	400	96.9	155.68	23.82

13.2.5 Performing Out of Limit Actions Using WeldScore™

Power Wave Manager can be used to configure a desired minimum for WeldScore™ and ranges for weld duration, amperage, voltage, and wire feed speed for each weld profile. It can then setup actions to be taken if these values are not met for a certain amount of time.

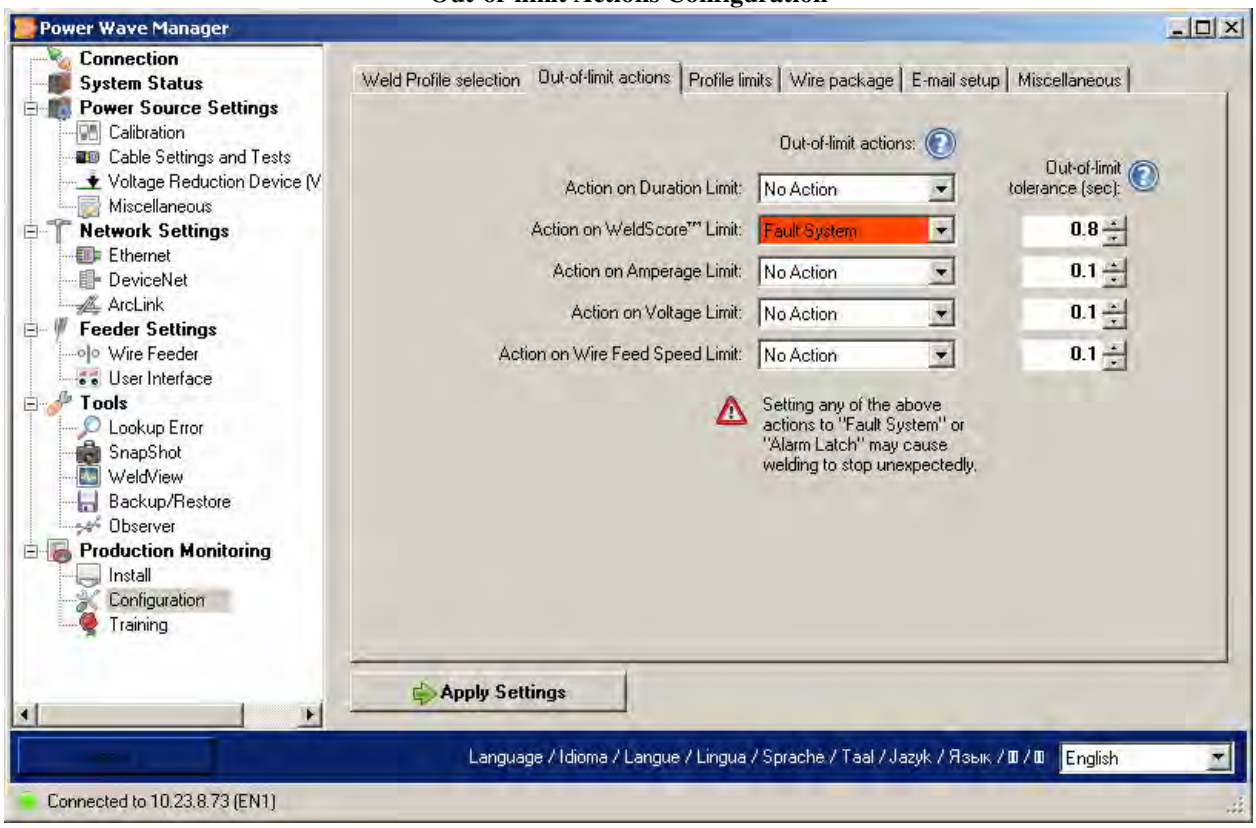
The "Profile limits" tab under "Configuration" in the "Production Monitoring" section of Power Wave Manager is used to setup profile limits, as shown below:



To set a minimum value for WeldScore™, first select the appropriate weld profile, and then check the enable box next to “Minimum WeldScore™”. The default as well as minimum value for this setting is 80. If a minimum WeldScore™ limit of less than 80 is required to keep good welds from being flagged as bad, this is an indication that either the training was done incorrectly or that a variable has changed since the training was done. The profile should be retrained if this is the case; lowering the minimum WeldScore™ is not an appropriate way to compensate for training not matching the production weld.

To perform an action if the WeldScore™ falls below the minimum value set here, click on the “Out-of-limit actions” tab and a screen will appear that looks like the following:

Out-of-limit Actions Configuration



The possible actions are:

- No Action – The Power Wave® will take no action, and will not mark the weld as out-of-limits.
- Log Event – The Power Wave® will mark the weld as out-of-limits.
- Fault System – The Power Wave® will stop welding when an out-of-limit condition is detected.
- Alarm Latch – The Power Wave® will enter into a faulted state when the weld ends, and remain faulted until the fault is reset by the operator (a so-called “latched fault”). A latched fault can be reset either through a UI such as a PF10M, through a DeviceNet polled IO connection, or through an ArcLink compatible controller that supports this feature. Note, resetting or cycling the power to the Power Wave will also reset a latched fault.

The field labeled “Out-of-limit tolerance” sets how long the WeldScore™ can fall below the minimum limit specified under the profile limits tab before the action set here takes place. This time represents the total amount of time the item can be out of limit for the duration of the whole weld. This value is represented in seconds and has a 250 millisecond resolution.